

JORGENSEN STEEL FORGE DIVISION

**STEEL MAKING
FORGING
HEAT TREATING
MACHINING**



USEPA RCRA



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INTRODUCTION

The Earle M. Jorgensen Company for more than 55 years has been a distributor and processor of steel and aluminum. Today, the company markets its products through a nationwide chain of 22 plants and sales offices in 19 major metropolitan locations.

The Forge Division of the Earle M. Jorgensen Company is a major producer of large, custom forged, precision machined heavy industrial forgings for such widely diversified industries as shipbuilding, power generation, mining, oil, petro-chemical, and even the steel industry itself.

Major products of the Forge Division include a full line of die steels, ship shafting, turbine rotors, tube sheets, crusher shafts, kelly bars, rolling mill universal drive shafts, large rolled gear blanks, sister hooks, bail links, nuclear components, pressure vessel fittings, and heavy wall pipe. In addition, semi-finished billet stock for nationwide sale to other forging shops is a significant product.

The Forge Division consists of two plants with over 500 employees — one on a 22-acre site in Seattle, Washington, the other covering 4 acres within the large Jorgensen complex in Los Angeles, California.

Facilities include two 40-ton basic electric furnaces, a 42½-ton AOD refining vessel, a Stokes vacuum degassing unit, open die forging presses from 500 ton to 3600 ton capacity, flat die steam hammers from 2500 lb. to 6000 lb., ring rolling mills with capacity to 180" diameter and 32" high, and a 7½" upset forging machine. In addition, heat treating departments are equipped for vertical quenching in oil or water and for the horizontal heating of forgings up to 73 feet in length. A completely equipped machine shop can handle large forgings on engine lathes, trepanning lathes, vertical and horizontal boring mills, planers, and hones.



MELTING

The melt shop consists of two 40-ton basic electric arc furnaces and a 42½-ton AOD (Argon-Oxygen Decarburization) Unit. Ingots ranging from 21" to 69" nominal diameter and 4000# to 74,000# yield are produced by either basic electric arc furnace or AOD practice. Larger ingots 73" to 77" nominal diameter and up to 130,000# yield are produced by the basic electric arc practice. Billets or forgings can be produced directly from these ingots.

Steel grades melted include the more popular carbon, alloy, and stainless analyses, as well as special grades developed by the Jorgensen Company and its customers. All steel is produced from carefully selected scrap and is refined utilizing a double slag practice.

The AOD process reduces gases to an acceptable level. It also provides vigorous agitation for mixing and dissolving the alloys as well as reduction of sulfur to very low levels. This reduces the formation of harmful inclusions and improves the inherent ductility of the steel.

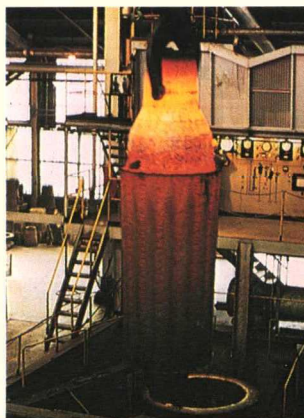
All basic electric arc furnace steels are further processed through the Stokes vacuum degassing unit for removal of dissolved gases and to insure that all alloying elements are thoroughly dissolved and mixed, thereby reducing the formation of non-metallic inclusions.

This process may also be applied to AOD produced steels when specified or when necessary to meet customer specifications.

The Stokes system of stream degassing offers an important flexibility. When a number of ingots is to be cast, a ladle is placed inside the vacuum chamber to receive the degassed metal. When one large ingot is required the mold itself is placed inside the vacuum chamber.



Tapping 40-ton furnace



Stripping 79,000-pound ingot



Vacuum stream degassing, ladle-to-ladle



AOD Vessel



Varied ingot mold sizes on teeming floor



FORGING

Open die equipment includes four forging presses with rated capabilities of 3600, 1500, 1000, and 500 tons. The 3600-ton oil hydraulic press with its 150 foot-ton manipulator is a modern, efficient, integrated unit that may be controlled manually by one man or programmed to produce uniformly sized forgings. Two steam hammers with rated capacity of 6000 pounds, two at 3500 pounds, and two at 2500 pounds complete the open die facilities.

The wide range of press and hammer capabilities makes possible a great variety of shapes which can be processed with various forging techniques. The usual technique is a drawing-down operation, starting with an ingot or billet and reducing the cross-sectional size to a round, square, rectangle, or slab. Upset forging a billet to produce a pancake or disc or upset forging and sub-

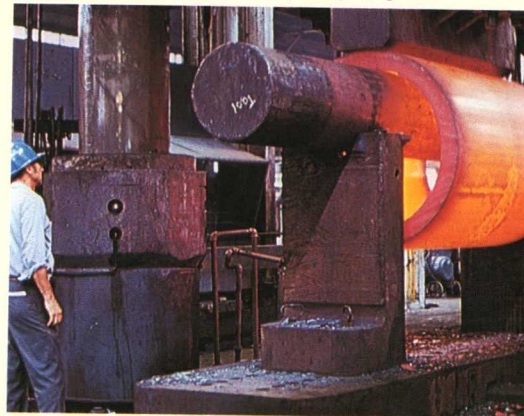
sequent drawing out in a direction normal to the upset are techniques used to optimize properties and improve quality. Ring and sleeve forgings are made by upsetting, punching a hole in the center of the disc, and mandreling to the finish dimensions. The upset and punched disc can also be finished on the ring mill, described on the next page, to impart different properties.



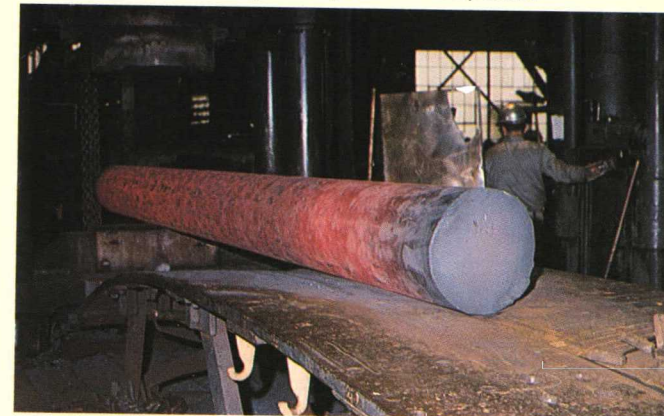
Initial breakdown of large ingot



18" billet on 25-ton integrated hydraulic manipulator



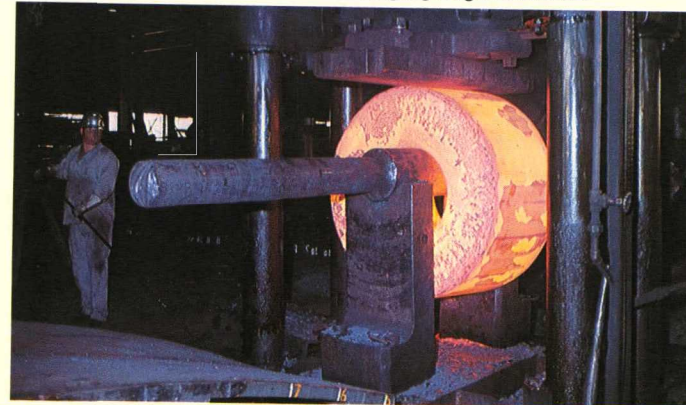
Mandreling large sleeve on 3600-ton press



Press forging large round bar



Upsetting flanges on 85,000 lb. tail shafts for naval vessels



Mandreling ring on 1000-ton press



FORGING

(CONTINUED)

A horizontal ring rolling mill can produce rings in steel and aluminum up to 15,000 pounds gross weight with diameters up to 180" and heights up to 32". An important feature is the pair of horizontal edging rolls which control the height and help maintain square corners, thus minimizing the amount of machining required to finish to ring.

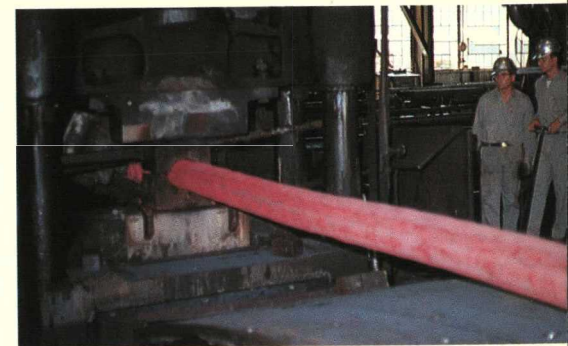
Closed die equipment consists of a 7½" upset forging machine, with the capability of upsetting steel bars to 11" diameter.

Gas and oil fired furnaces with temperature controlling instrumentation supply the presses and hammers with steel and aluminum heated to proper forging temperatures.

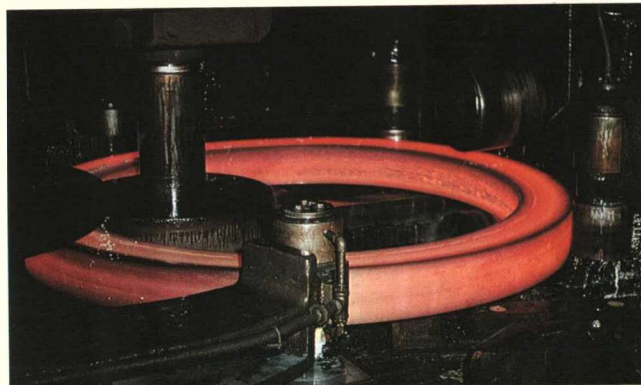
Forging specialists and metallurgical engineers are available for consultation and advice on the most economical approach to your forging problem.



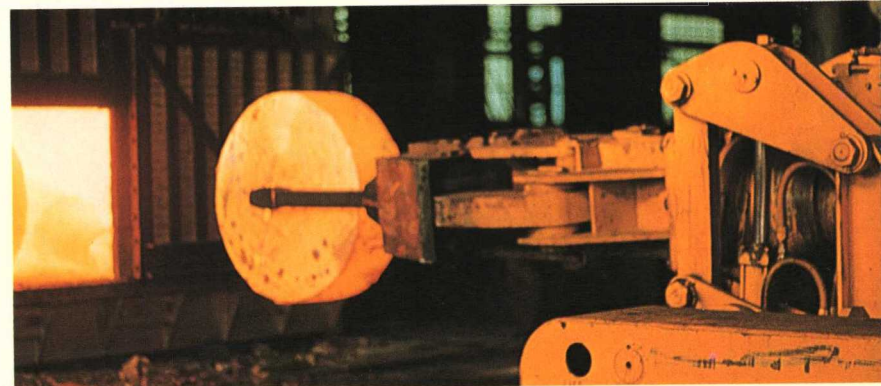
Mandreling small sleeve on 6000-lb steam hammer



Forging round bar on 1000-ton press



15' diameter ring rolling mill



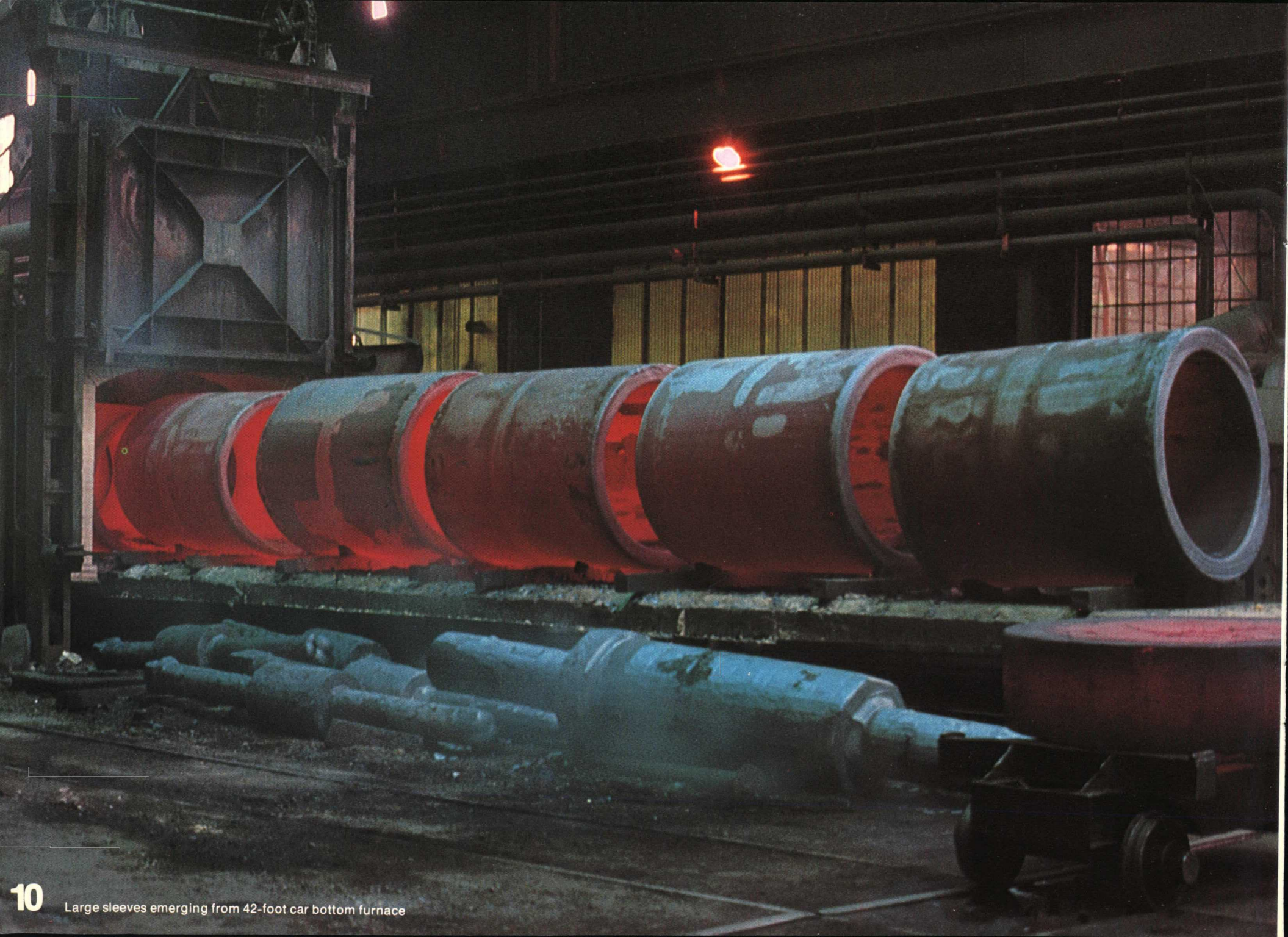
Hammer manipulet removing large disc from furnace



Upsetting disc on 6000-lb steam hammer



6000-lb steam hammer



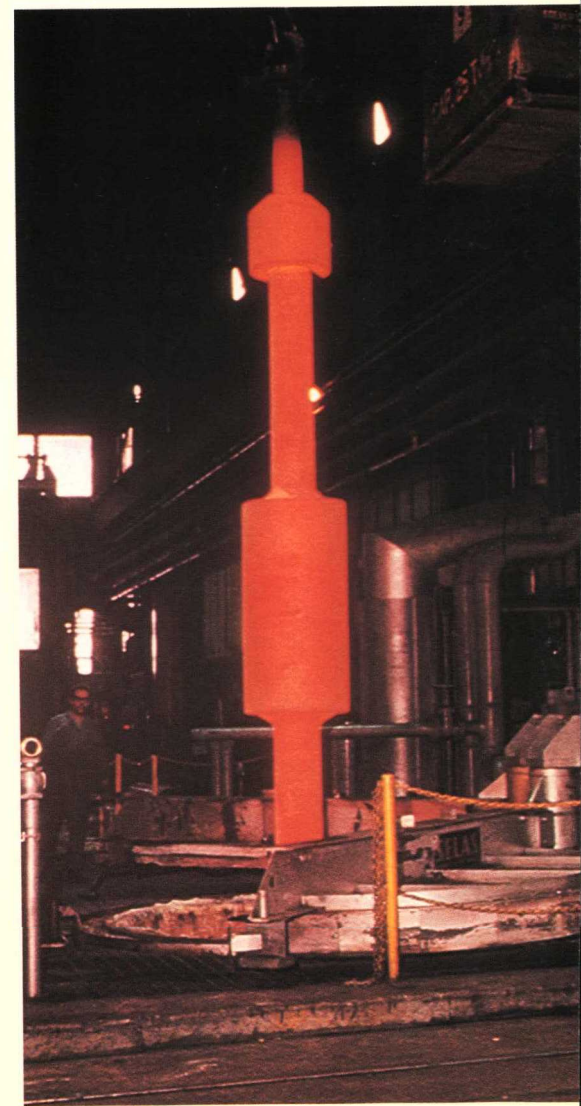
HEAT TREATING

Heat treating facilities are capable of performing standard heat treatments and handling the wide range of forgings produced. Horizontal car bottom furnaces can stress relieve, anneal, or normalize forgings up to 73' in length or 18' diameter. Vertical quenching can be performed in lengths up to 32' in water, 22' in oil, and 12' in polymer.

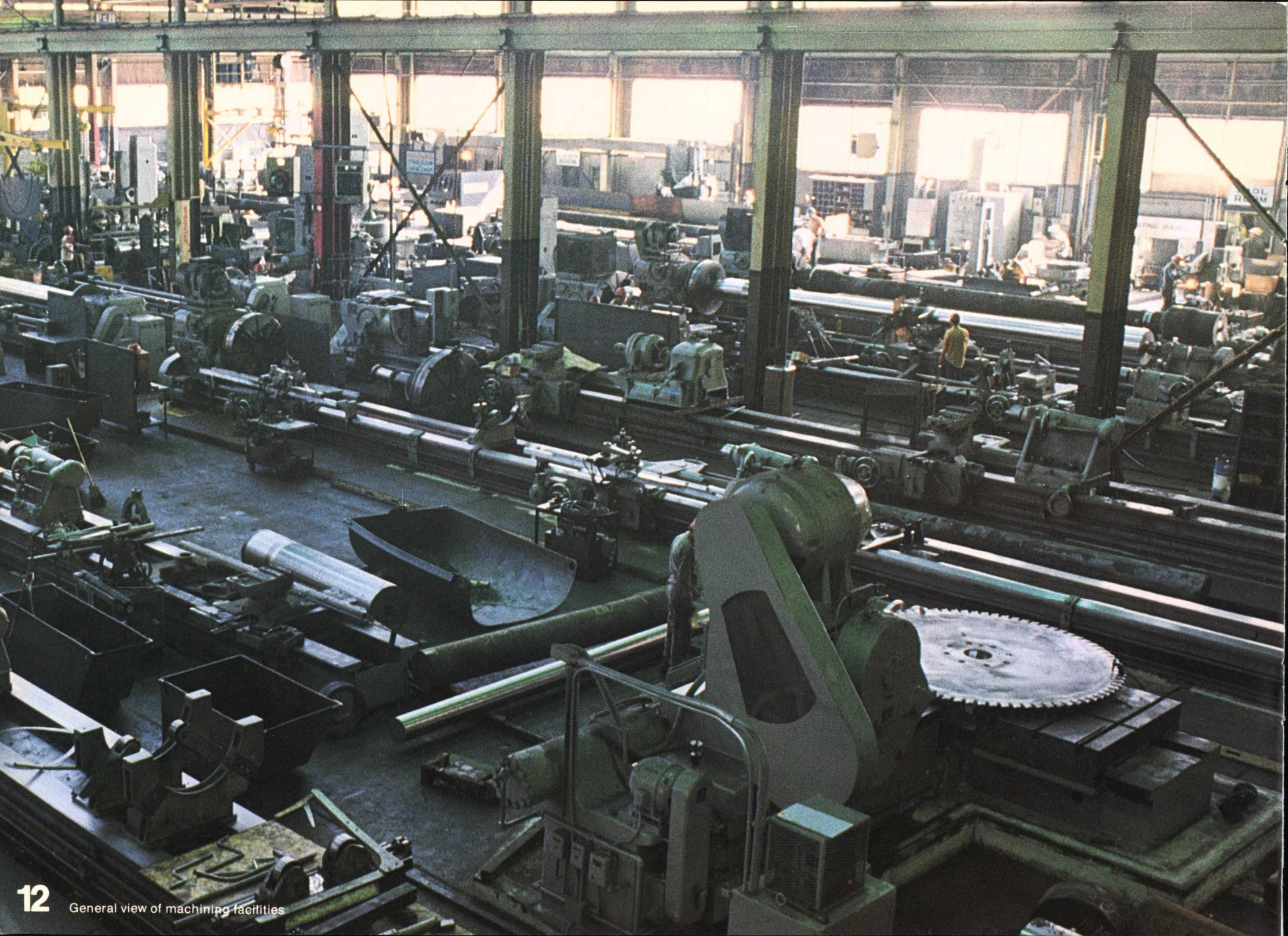
All furnaces are equipped with dual fired combustion systems with the latest temperature controls, and are carefully balanced and checked for uniformity of temperature. The quench tanks utilize efficient agitation and heat exchangers to insure proper temperature control.



Normalizing forgings
in 38' car bottom furnace



Heat treating in
vertical furnace

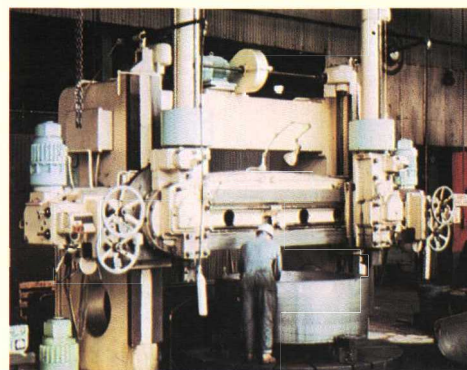


MACHINING

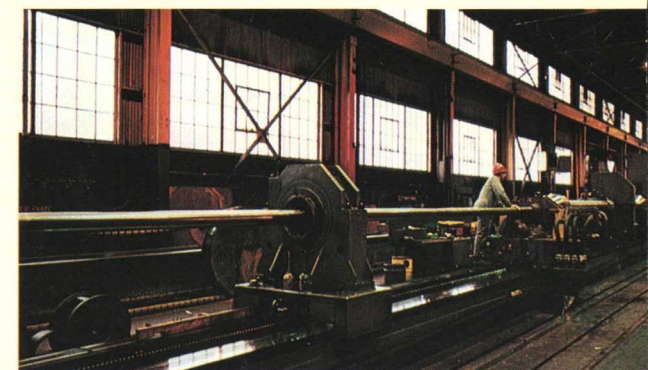
The machining operations of the Jorgensen Forge Division, spread over 86,000 square feet, consist of all the necessary machine tools to produce precision finished heavy industrial components. Engine lathes number 38 and can handle forgings up to 102" in diameter and 70' in length. Vertical boring mills accommodate forgings up to 20½' in diameter and 100" in length or height. In addition to these machine tools, there is the usual basic equipment including horizontal and planer mills, radial drills, shapers, external, internal and surface grinders, large circular saws, and hack saws.

For more specialized products such as heavy wall pipe, hollow shafting, and pressure vessel components, four trepanning lathes can efficiently produce accurate

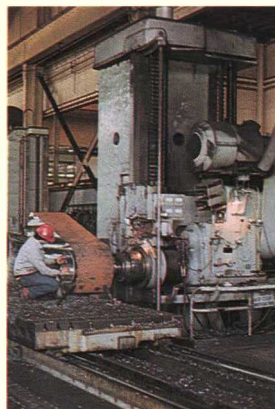
holes up to 36" diameter with lengths up to 60'. The cutting head of the trepanning tool attached to a tubular boring bar penetrates the steel far faster than the more conventional spade or gun drilling. Where a finer finish or closer tolerance is required, holes may be honed up to 18" diameter with lengths up to 36'.



120" vertical boring mill



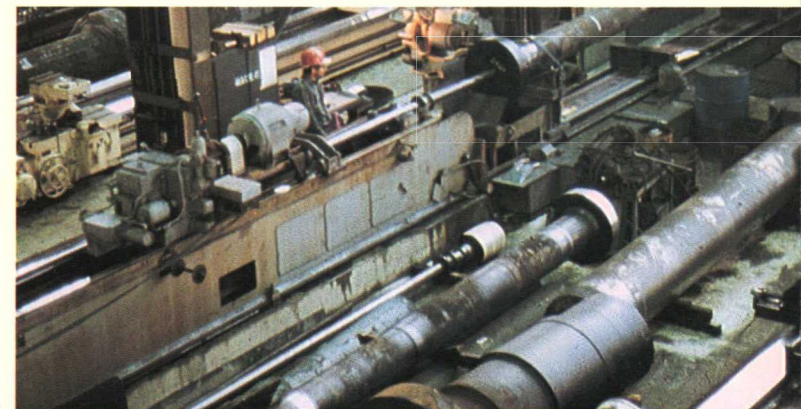
165' hollow bore lathe



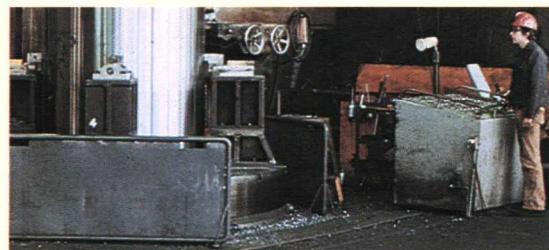
8" horizontal boring mill



60" x 70' engine lathe



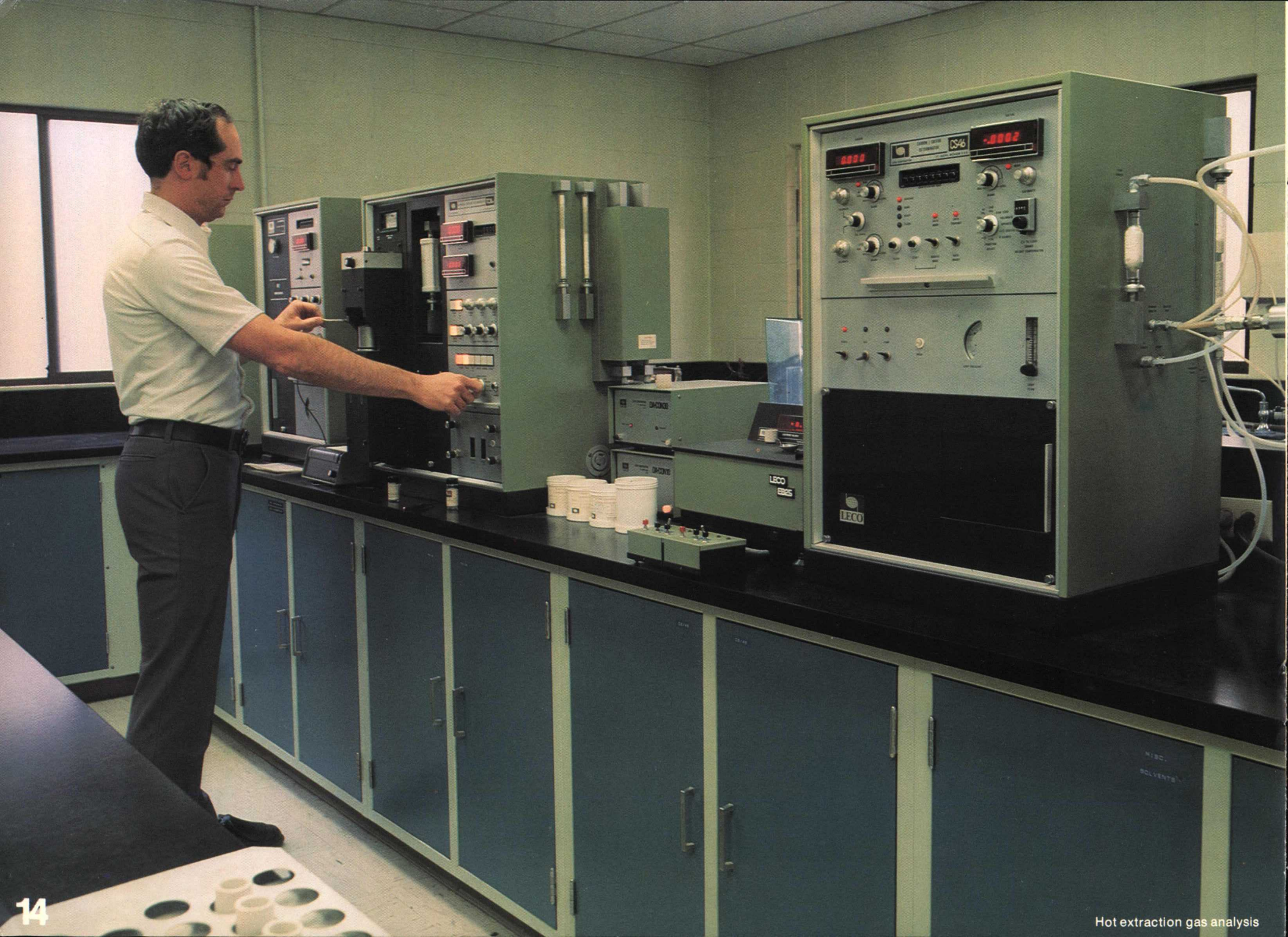
18" horizontal hone



240" vertical boring mill



Small lathe section of machine shop

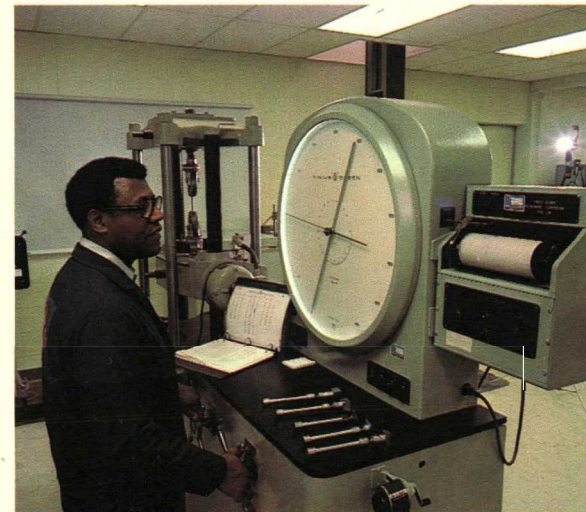
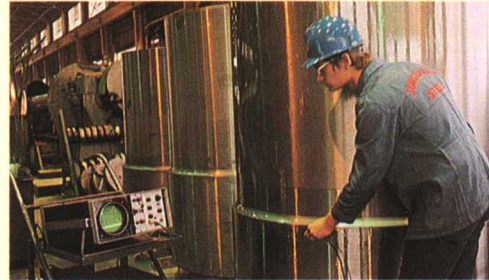


QUALITY ASSURANCE

Quality is evident in every operation of the Jorgensen Forge Division. It is noticeable in the degree of housekeeping practiced constantly throughout the plants, and in the pride and care with which individuals handle their responsibilities.

The formal program of quality assurance is based on a manual that places controls on operations and materials and covers testing and calibration of instrumentation and test equipment. It is also based on sound quality administration which covers management and documentation.

The Quality Assurance Program conforms to critical ASME, Navy Nuclear, and other standards and is under constant surveillance by external auditors.





Turbine rotor



60" diameter tube sheet



Turbine shaft



Semi-finished kelly bar forgings



Contour-rolled rings



Contour machined ring

PRODUCTS

MARINE COMPONENTS

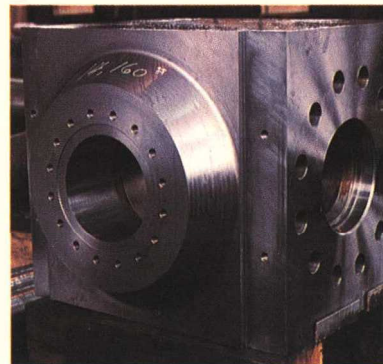
Propulsion shafting is produced for cargo ships, naval vessels, submarines, tug boats, ferry boats, and tuna seiners. The facilities are capable of making a finished solid or hollow-bored product, including the installation of bearing sleeves, the application of protective covering of glass or rubber, match reaming of coupling flanges and fitting coupling bolts, and dynamic balancing.

Other marine components include couplings, sleeves, rudder stocks, and related parts.

ELECTRICAL POWER GENERATION COMPONENTS

Turbine rotor shafts for water, steam, or gas driven electric power generators represent a product line calling for the greatest attention to quality at each stage of manufacture, from the making of the alloy steel to the precision machining.

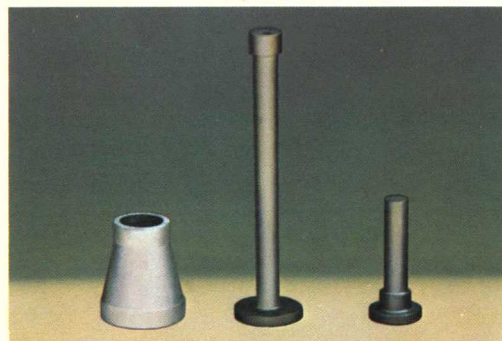
Rotor shafts are produced in diameters up to 32". Upset tube sheets weighing up to 50,000 pounds are routinely produced. Additional components include high pressure steam generator nozzles, pipe, flanges, fittings, and nuclear components to Section III of the ASME Code.



High pressure fitting



Stainless steel "Y" fitting



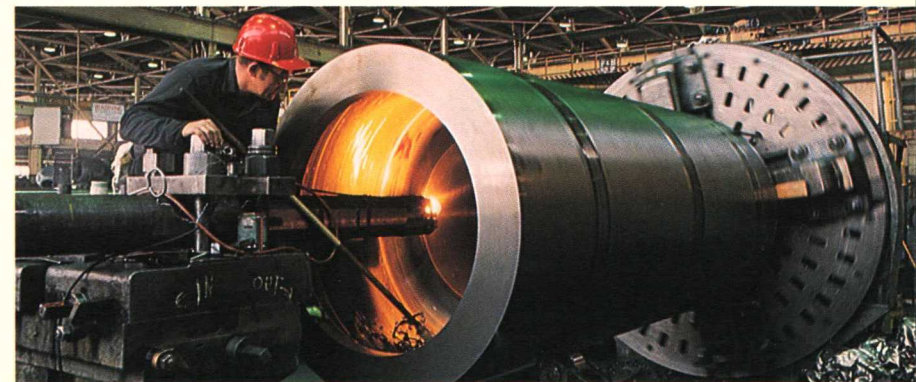
Closed die upset forgings



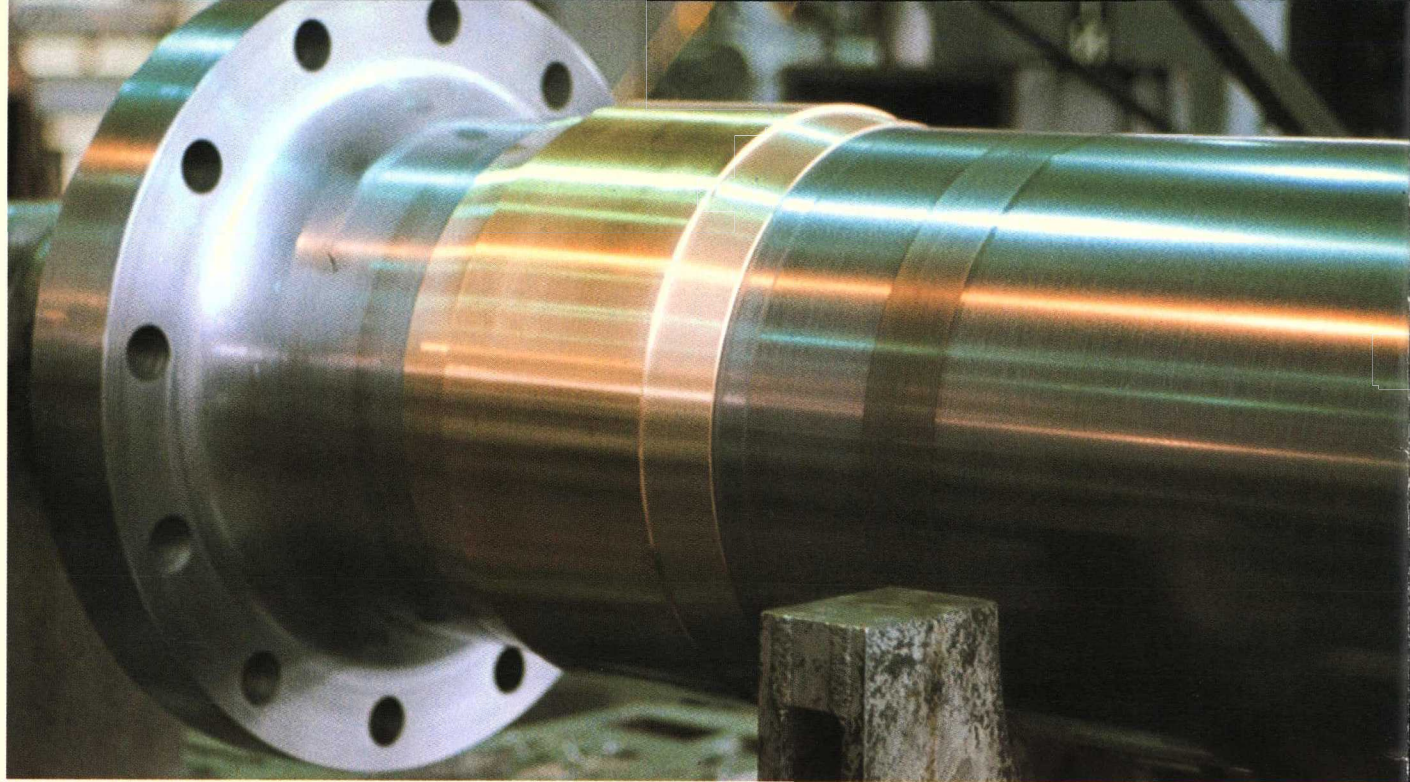
Complex closed die forging



Milled ring



Pressure vessel body



Marine shaft with liner



Elevator link



Bail link blanks

PRODUCTS

(CONTINUED)

OIL TOOLS

Square kelly bars up to 60' in length and round kelly bars subsequently milled to a hexagonal configuration are major products. Down hole oil tools include non-magnetic drill collars, reamer bodies, and sub stock. Large pressed rounds are the starting stock for drill bit cutters.

HIGH PRESSURE COMPONENTS

Valve bodies, cylinder barrels and liners, pistons, and intensifiers are components for the polyethylene-polypropylene petrochemical industry that require a high degree of reliability in a specialized type of forging. Other components requiring the highest quality available in electric furnace, double slag refined, vacuum degassed alloy steel include pressure vessels, pipe, and fittings.

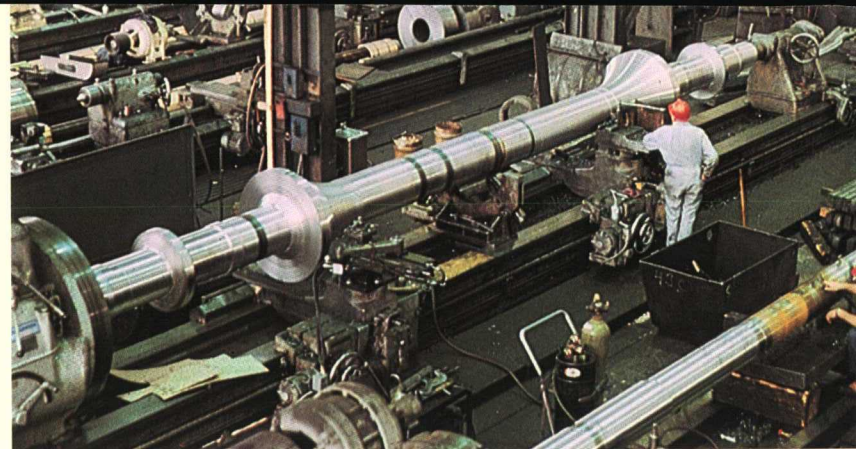
MINING EQUIPMENT COMPONENTS

Components produced for the mining industry are massive forgings that call for steel cast in extra large ingot molds so that the finished part has sufficient reduction in the forging process to insure internal soundness and quality. Examples are crusher shafts, crusher rolls, and tunnel boring tools.

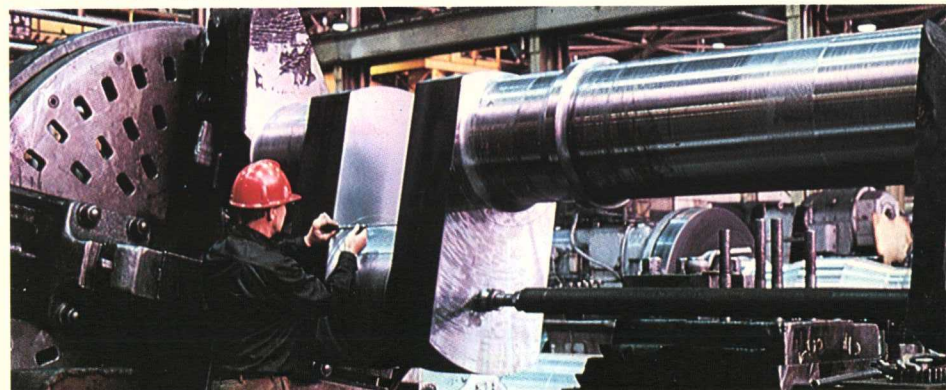
DIE STEELS

J-DIE* grades are AOD steels, produced to the exacting standards set by hot work die steel users.

The outstanding characteristics of J-DIE Steels are due in part to the low sulphur content (typically .006), coupled with a substantial reduction in harmful oxide inclusions. The direct results are superior surface quality, resistance to heat checking, and noticeable improvement in mechanical properties, particularly impact strength, all leading to improved die life.



Water turbine shaft



Crankshaft for mechanical press



Small step shafts



Reduction gear shafts

*J-DIE is a trademark of Earle M. Jorgensen Co.



Pump barrel



Finished ship shaft

PRODUCTS

(CONTINUED)

CLOSED DIE FORGINGS

Closed die forgings made on an upsetter offer advantages over open die forgings where large quantities of identical parts are required or where a particular grain flow is desired. Bar stock may be upset to 11" diameter. Two general configurations are possible — one in which bar stock diameter is enlarged only, and one in which the bar stock is enlarged and a hole punched into the center.

Critical parts made as upset forgings include such components as helicopter main transmission gear, aircraft hydraulic pistons and cylinders, and rocket nozzles.

MECHANICAL POWER TRANSMISSION COMPONENTS

Large diameter ring gear forgings in carbon and alloy steel manufactured on a ring rolling mill are an important product of the Jorgensen Forge Division. Rings produced in this manner have an unbroken grain flow. Wall thicknesses or inside diameters are limited by the weight of the ring which cannot exceed 15,000 lbs. Pinions, quill shafts, sugar mill shafts and

hubs are other examples of industrial forgings for power transmission.

GENERAL INDUSTRIAL EQUIPMENT COMPONENTS

Components for general industrial equipment demand a wide range of talents for an open die forging operation since parts are not necessarily symmetrical. The art of the blacksmith using modern sophisticated equipment is called for in producing such items as single hooks, sister hooks, 4-prong hooks, bail links, and fork-lift tines.

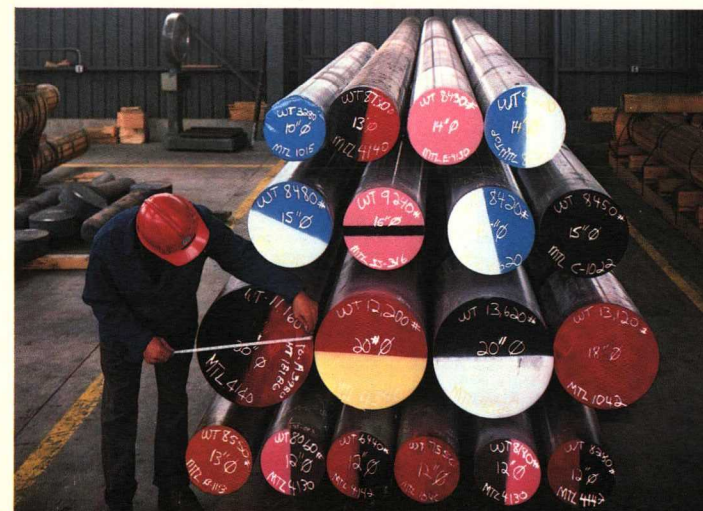
Rotary cement kiln tires are produced on the large ring rolling mill. Diesel engine crankshafts start with crankshaft quality steel, and are forged and machined to produce the individual throws in the proper planes.



Fork-lift tines



Billet products



Pressed round bars

CONCLUSION

This is the Jorgensen Forge Division. Tomorrow it will have changed as new equipment, with new capabilities and capacities, has been added to accommodate new manufacturing challenges. There is a continuing program on the part of management to update plants and equipment. The capital improvement program is a vital part of the philosophy of the Earle M. Jorgensen Company.

This brochure is intended to give you a picture of the scope of the facilities and capabilities of the plants of the Jorgensen Forge Division in Seattle and Los Angeles. A picture is worth a thousand words, and the photographs have been chosen to show the extent of our present capabilities. A visit is worth a thousand pictures, and we would like to be given the opportunity to show you personally what we can do for you.

LOCATIONS

SERVICE CENTER AND SALES OFFICE LOCATIONS

LOS ANGELES

(213) 567-1122

SAN DIEGO

(714) 276-6850

OAKLAND

(415) 835-8222

HONOLULU

(808) 836-1611

HOUSTON

(713) 672-1621

DALLAS

(214) 741-1761

TULSA

(918) 835-1511

DENVER

(303) 287-0381

KANSAS CITY

(816) 842-7300

CHICAGO

(312) 569-3737

PHILADELPHIA

(215) 934-5200

BALTIMORE

(301) 727-0123

PHOENIX

(602) 272-0461

SEATTLE

(206) 762-1100

DETROIT

(313) 547-9000

LANSING

(517) 694-0441

DAYTON

(513) 276-5961

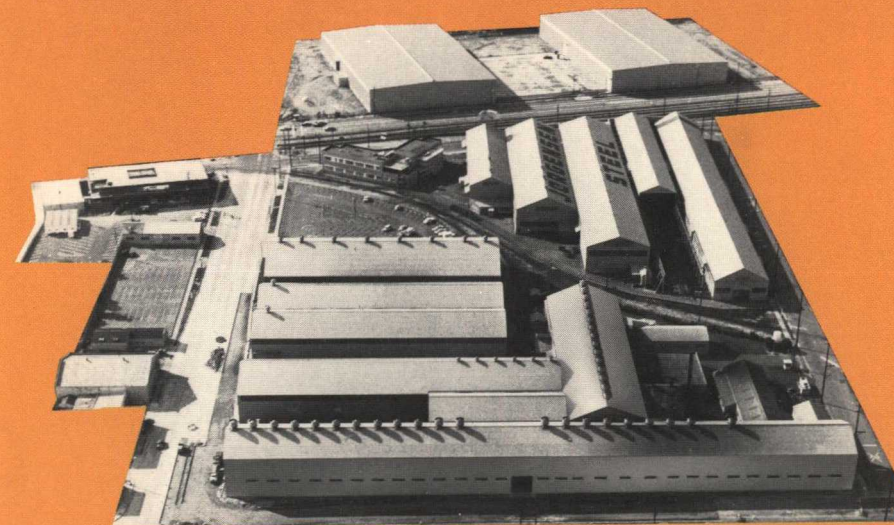
CINCINNATI

(513) 771-3223

CLEVELAND

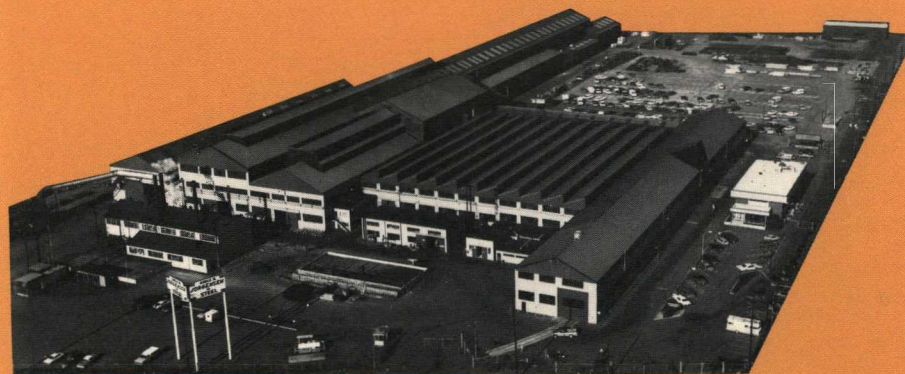
(216) 292-5555

LOS ANGELES PLANT



10650 Alameda St., P.O. Box 54633, Los Angeles, Calif. 90054
Phone: (213) 567-1122 Telex: 67-7184

SEATTLE PLANT



8531 E. Marginal Way, South, P.O. Box 3970, Seattle, Washington 98124
Phone: (206) 762-1100 Telex: 3-2280



JORGENSEN STEEL
Forge Division